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Address.

THE RAT IN HEALTH AND ECONOMICS.*

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THE story of the rat is a big story and a long story, and covers a large field in health and economics. For some years it has, unfortunately, been the general custom to regard rats as a joke and the word has been used as a slang phrase of derision and contempt. But it is time now for the public to wake up to the fact that rats are no joke and that they are a very serious menace to humanity. It is time for self-respecting citizens to get together and exert themselves to destroy this pest. Is it possible that rats are more intelligent than men? It would almost seem so when we consider that it is only through human negligence and support that they exist. Rats live on the products of man's labors. They eat the food he has provided for himself. They destroy the property which he wishes to enjoy, and they live in the homes and buildings which he has constructed for his own use. Were they deprived of all these comforts, they would rapidly disappear. But just as long as human beings regard them with apathy, and furnish them with domiciles and food, rats will increase and multiply until finally they will become equal rivals for existence with man and may possibly conquer him.

This statement may, at first, seem very wild. but already the rat population not only equals. but exceeds the human population in this country, and the fecundity of the pest is terrific. Females breed at the age of three months; they have from six to ten litters a year and these litters number from eight to eighteen. The period of gestation is only twenty-one days. And the better fed and the better housed the rats, the oftener they breed and the larger the litters. Federal authorities compute that a healthy pair of rats, provided all progeny live, will be accountable for 800 descendants within one year.

At present prices, it costs about two cents a day to feed a rat. Therefore, on conservative estimate of one rat to one human, the rat population in this country is over 100,000,000 and the cost of feeding them may be figured at $2,000,000 a day, or $730,000,000 per year, besides the damage they do in the destruction of property. The federal authorities place this at about another $200,000,000 annually, and the constant labor of 200,000 men is required to produce the materials destroyed by rats. It is unthinkable that civilized people should rest supinely under such conditions.

* Address to Boston School Physicians.

Rats are omnivorous. They eat all prepared foods of men, meats, grains and vegetables. They even attack seeds planted in the ground and climb trees to eat their fruits. They enter stores and warehouses and destroy all sorts of merchandise. They enter libraries and chew books and bindings. They gnaw water pipes and cause floods. They gnaw insulation from electric wires and produce fires. And yet people smile when we talk of rats!

Three kinds of rats abide in this country today. None of them are native, as our indigenous rodents, such as gophers and squirrels, are of a different species. All are emigrants from the Old World and most undesirable immigrants which should be barred entrance.

The three imported species of rats are: the Mus rattus, or black rat; the Mus alexandrinus, or roof rat; and the greatest and most dangerous pest of all, the Mus novegicus, although it is a libel on Norway to have so named him. This latter species is commonly known as the brown rat, the wharf rat, the sewer rat, the gray rat, the barn rat, etc.

Mus rattus is somewhat smaller than his cousin, Mus norvegicus, who kills and eats him at all opportunities, and has practically driven him out of this section, although this species is constantly arriving on incoming European ships.

Mus alexandrinus lives largely in buildings, dwelling in walls of houses and between floors and ceilings. He also finds it hard to exist in the presence of Mus norvegicus, except in the southern states, where the climate permits him to live and nest in trees.

But of all bad rats, and all rats are bad, Mus norvegicus is the worst. He lives everywhere, and no other animals are able to exterminate him, because he is fed, protected and housed by man. While he is of a burrowing species and naturally finds his abode in the fields and along the banks of streams, he has quickly learned that he can live at greater ease and without exertion in the buildings erected by man. Therefore, while many do infest ground burrows all the year round, others live in the fields during the warm months and then abandon their natural habitat to invade houses and barns during the winter, while others live in such places constantly.

Like most of the plagues of the world, they are of Asiatic origin, and probably originated near the locality of the old Garden of Eden. They emigrated from Asia along in the early middle ages and rapidly spread over Europe. In 1714 they crossed the channel to England, and are supposed to have taken passage on the very ship that carried King George to the British throne. For this reason our English cousins, who did not love their German dynasty, named them Hanoverian rats. Sometime about the middle of the 18th century, English ships brought them to the colonies and they rapidly spread along the Atlantic coast and gradually westward. By 1870, they had reached the Mississippi, and by 1900 they had covered the entire North American Continent.

An exodus of these animals from cities and villages to river banks and farmsteads in the surrounding country takes place every spring, and is followed by a return migration each autumn. This explains why rats are more abundant in towns during the cold season, while in the country they occur in largest numbers during the summer months.

The city is the great stronghold of the rat—its permanent refuge, and its last line of defense; for the institutions peculiar to large cities favor the rat and account for its abundance. The old wooden wharves, the extensive lumber yards, the large markets, the ancient factories, the grain elevators, the railway terminals and freight yards with many other features, attract and harbor these rodents.

A city sewer system is a permanent abode and also a most convenient and extensive highway for their travel from one point to another, while old, broken and abandoned sewer pipes offer a runway for rats into basements.

Rats migrate from places where food is scarce to places where it is plentiful; and abundant food in a new locality causes an abnormal reproduction, the effect of which in a short time is that of a sudden invasion of a cast horde of rats. All means of travel known to man were rapidly seized by these pests, but the introduction of railways and the use of freight cars accelerated their movements to an unprecedented degree, and the extension of water commerce has aided them greatly. No ships are free from travelling rats, and few freight cars are clear of them. If you doubt me, visit the waterfront or the railway yards and see for yourselves.

To eliminate the rat and safeguard our lives and property, we must prevent immigration, through inspection and killings on wharves and

in freight yards; enforce rat-proofing laws in our buildings; and see that food is kept inaccessible.

I am not going to take up your time this morning by going into details by which these things may be accomplished, but shall confine my remarks more especially to the medical phase of the subject, which is very important, and whose importance is neither realized nor appreciated, either in the profession in general or by the laity.

Rats are great spreaders of disease. As fur-bearing animals, they frequent the dirtiest places,—sewers, garbage dumps, stables, etc. Their bodies are covered with fleas and with germs of all kinds, which they bring into our homes and scatter about our pantries, and carry into our markets to disseminate about our food supplies. Aside from such germs as may abide in the fur, the rat is the known carrier of two diseases, trichinosis and bubonic plague, and is suspected of a third, leprosy, although it has not to date been proved that rat leprosy and human leprosy are interchangeable. No epidemic disease has been so fatal to man as bubonic plague, which is characterized by swelling of the lymphatic glands nearest the point of inoculation into large and painful tumors called "buboes," which generally occur in the groins and armpits. The mortality is very high, generally ranging around 95 per cent. Our English word, "plague," and the German "plage" are derived from the Latin "plaga,"—a blow,—while the French "fleau," meaning "flail," conveys the same idea. In fact, all terms for epidemic pestilence in all languages, European or Oriental, are derived from such sources.

In trying to outline the bubonic plague from the earliest times, we are immediately confronted with the difficulty of distinguishing true Oriental plague from other epidemic diseases that afflicted humanity at various periods. In ancient and mediaeval writings of every people, we find narratives of pestilence, but whether these afflictions were those of true bubonic plague, typhus, syphilis, smallpox, cholera or other disorders, it is difficult to determine unless we find mention of the presence of buboes —the characteristic sign.

It is especially difficult to distinguish epidemics of typhus from those of plague, as their confusion has prevailed down to comparatively modern times, even among medical writers,—undoubtedly due to the fact that the two diseases have been often commingled in one and the same epidemic, which is no great cause for surprise when we remember that plague is propagated by fleas, and typhus by body lice. We find such commingling in the epidemics of 1568 in France; of 1624-5 in London; of 1636 in Holland; of 1720 in Marseilles; of 1760 in Aleppo; and 1771 in Moscow.

Probably the earliest record we have today of a plague epidemic is that recorded in I. Samuel, chapters 4, 5 and 6, where we read that the Philistines, having crushed the Israelites and captured the ark, carried it off to Ashdod, for which sacrilege Jehovah smote them with seven months of pestilence, which was only terminated by the return of the Ark and the offering of *five golden emerods* (bubonic tumors) and *five golden mice*, thus showing the recognition of the part played by rodents in dissemination of plague.

The plague of David, recorded in II. Samuel, Chapter 24, which killed 70,000 in three days, may have been bubonic, but there is nothing in the record to distinguish it as such, despite the fact that Pierre Mignard's celebrated picture, done in the latter part of the 17th century, has a stricken physician in the foreground lancing a bubo.

So, from lack of explicit information as to their character, we shall pass over the numerous and almost continuous epidemics that ravaged Rome and her possessions from her foundation in the time of Numa Pompillius until the great plague of the 6th Century, A. B. This started in Antioch in 540, passed through Byzantium, Auvergne, Marseilles, Rome, Avignon and Strasbourg, lasting 52 years and destroying over 50 per cent. of the population.

Between the 11th and 15th centuries, Europe suffered from 30 epidemics of bubonic plague, the most celebrated being the famous "Black Death," which killed nearly 50 per cent. of the population of the known world. Originating in the north of China in 1333, it spread out in every direction, north to the Black Sea, west into India and Asia Minor, and through Arabia, Egypt and northern Africa. From Asia Minor, commerce rapidly carried it through the Mediterranean, to the great seaports of Greece, Italy and France, whence it moved northward through Germany to the Baltic and across to the British Isles. I shall not dwell upon the horrors of the terrible Black Death, but recom-

mend to those who desire to investigate the subject, Hecker's remarkable book with its wonderful detail, and the introduction to that masterpiece of Italian prose, Boccaccio's *Decameron*. It is interesting to note that one result of this frightful epidemic was the production of many wonderfully beautiful churches and religious works of art, such as that peerless masterpiece of Sodoma, the banner of St. Sebastian, patron against pestilence, in the Uffizzi gallery at Florence; and the Sistine Madonna of Raphael,—both plague banners.

After the Black Death, the special intercessor against plague was St. Roch, owing to his having so bravely nursed the sick throughout the stricken cities of Italy, contracted the disease and given his life in this noble work. Many beautiful paintings abound of this worthy man, always representing him as showing the bubo in the groin, and generally accompanied by his faithful dog.

Despite the efforts of practical men to discover the origin and means of communication of the disease among whom we must pay all honor to that noble and broad-minded pontiff, Clement VI, who ordered autopsies at Avignon, so little were real causes recognized that the greatest superstition prevailed and all sorts of queer ideas ran rampant. The origin of the epidemic was laid to all sorts of causes—to demons, to witchcraft, to magic markings of doorways, etc., and because a majority of Christians believed that their sufferings were due to having treated the Jews with too great leniency, horrible persecutions of this despised race abounded throughout Christendom. They were accused of poisoning wells and even of infecting the air. Thousands of them were openly murdered, their houses burned, and even the bricks and stones scattered.

The ancient idea that disease was sent to punish mankind by the wrath of an offended and vengeful deity was revived among the ignorant, and the fast declining cult of the Flagellants took on new life. Taking upon themselves the repentance of the people, they marched over all Germany, Hungary, Poland, Bohemia, and Silesia, scourging themselves with thongs and offering prayers and supplications to avert the plague, stopping only one night at any place and gathering to themselves men, women, and even children of the lower orders. Finally, they became so formidable to both the secular and ecclesiastical powers that they were suppressed by Charles IV and Clement VI, and forced to go to work. Those who refused to turn from vagrancy to some useful purpose were extirpated by fire and sword.

After this fearful plague visitation, it continued to make its epidemic appearance at various times in various places, the worst invasion appearing in 1527 in Rome, which had already had four visitations and was destined to receive seven more before the close of the century. Others occurred in 1530 at Geneva; in 1576 at Milan, which had another most awful epidemic in 1630 when 150,000 died; in 1665 in London; and in 1679 at Vienna. The last great outbreak in Europe was at Marseilles in 1720, when at one time so great had been the mortality that over 2,000 dead lay in the streets, and 1,000 more rotted on the quays. There were some 90,000 deaths in all.

For fifty years Europe was comparatively free from plague until 1770, when 80,000 died at Moscow. At the same time it appeared in the Balkan peninsula with slight epidemics in Greece and Italy. It broke out in Constantinople in 1803, destroying 150,000 lives, and again in 1815, when 110,000 died.

During this period, the disease was usually prevalent in the Orient, destroying great numbers of people yearly. In 1894 there was a serious one in Hongkong and in 1896 a great epidemic broke out in Bombay with a mortality of 30,000, increasing and expanding throughout India until it reached the high mark in 1897, when some 1,200,000 natives died of it. This caused the British Government to institute investigations which led to the discovery of the method of propagation by rat fleas which was published by the Indian Plague Commission in 1898. Between 1896 and 1905, the total deaths recorded in India, officially admitted to be below the mark on account of concealment on the part of the inhabitants, was 3,157,000, of which 1,040,429 occurred during 1904.

From December, 1899, to April, 1902, plague was epidemic in Manila and surrounding territory, but, under the active operations of the authorities in killing rats and destroying rat-ridden buildings, the number of deaths was not much over 500, although the mortality of those attacked reached 91.7 per cent.

In 1900, plague appeared in San Francisco's Chinatown, where it was confined to about twenty blocks of the Oriental quarter and claimed 121 victims, mostly Asiatics. It was

suppressed by the vigorous measures of the health authorities. In 1907, a second plague eruption occurred, when the disease was not confined to Chinatown, but appeared at different times in practically all parts of the city. Very few Orientals were affected, almost all of the 160 cases being white persons. This second epidemic, attacking white people, woke the city up to a realization that something must be done, with the result that a citizens' health committee carried on an active campaign, causing the destruction of 1700 buildings and the reconstruction of thousands more. The disease was rapidly communicated to the squirrels and extended throughout the state among rodents, so that even today it is necessary to continuously spend large sums of money in squirrel extermination.

In 1914, plague appeared in New Orleans, with the result that over $8,000,000 were spent in rat extermination and the rat-proofing of buildings.

A recent report of the Public Health Service shows plague in all sections of the world, from India and China through Syria, Greece, Italy, into Liverpool; also in Peru, Chili and Brazil. The epidemic in Tampico and Vera Cruz have been given considerable publicity, and the invasion of the United States has already occurred along the Gulf, plague cases having been found in New Orleans, Galveston and Beaumont.

As all authorities concur in the opinion that no port which does not have rat-proof docks is safe from an incursion of plague, we can view with alarm the rotten old wooden wharves that disgrace our waterfront, unscreened or otherwise protected, some of them over 100 years old and teeming with rats. We must wonder how we have been able so long to have escaped an epidemic. In fact, the waterfront conditions of Boston are most conducive of an invasion of bubonic plague, brought by vessels arriving directly from infected ports and at this very moment no one can truthfully say that there is no rat plague in Boston. It is more than probable that there are already within our limits many rats infected with this disease.

According to the best authorities, every case of human plague in a community costs at least $7,500 and every case of rodent plague at least $5,000. From a purely economic standpoint, rat-proofing is pure saving—and it only adds two per cent. to cost of construction. Should plague invade Boston, enormous losses would result from quarantine and the diversion of commerce beyond even approximate estimation; and yet, here we rest, one of the large Atlantic seaports (although by no means as large as we should be and could be under intelligent business methods) with rotten rat-ridden docks adjacent to a large market district and a disreputable tenement district, and hope that through Providence or good fortune to escape the results of our own apathy.

For such reasons, therefore, diagnosis of plague is a matter of much more than academic interest to the physicians of Boston, for when human infection does occur, the first observed manifestation will be a human case, and for diagnosis dependence must primarily be placed in the general practitioner. How many of them are capable of making such a diagnosis? I ask you, gentlemen, do you really believe ten per cent. of the regular profession are capable, and I make no reference to that vast army of irregulars who are so freely allowed to prey upon the public by our too liberal medical laws?

While it is not within my province, either from education or experience, to play the rôle of pathologist—and I refer you to such eminent authorities as Sir Patrick Manson, the founder of scientific tropical medicine; Dr. W. J. R. Simpson, Dr. Richard P. Strong, Admiral Stitt and the experts of the Public Health Service—it may be well here to give a brief description of the symptoms and some of the measures taken in epidemics, which are derived from the best authorities.

The symptoms are sudden onset, rise of temperature and marked prostration. At onset, frequently appears a mental haziness, disordered motor coördination resembling some stages of alcoholic intoxication (I presume you have not yet entirely forgotten such matters as occurred before January first, last year). A chill is quite common and buboes in the lymphatic glands are the signs. These are largely femoral, inguinal, axillary, and cervical. Nine times out of ten the bubo is in the femoral and usually on one side only, due to the rat flea generally biting the lower portion of the leg, but axillary buboes often occur due to infection of the flea bites on hand or forearm. The bubo appears suddenly, coincidentally with onset of the disease. The skin immediately above is hot and red, and the mass is exceedingly tender and painful to the touch. Unlike venereal swellings, it shows a broad flat surface, seldom coming to

a point and does not suppurate until a week or two after the onset, if at all. Pneumonia often follows, through invasion of the respiratory tract, and septicaemia follows direct entry of microbe into blood. The pneumonic form is very infectious through inhalation of dried sputum of victims being blown about, and spreads from man to man without aid of other carriers. Hemorrhages under the skin, making dark purple blotches of stagnant blood, "petechiæ" or "tokens" sometimes occur. This was the origin of the name, "Black Death."

It is only during comparatively recent years that the true cause of plague has been known, even so great an epidemiologist as Hecker himself having attributed it to astral and telluric causes.

The causal agent of the plague, the Bacillus Pestis, was first discovered in the Hongkong epidemic of 1894 on June 14, by Dr. S. Kitasato of Tokyo, chief of the Japanese Commission. About a month later, confirmation was made by Dr. Yersin of the Pasteur Institute discovering independently in the same epidemic the same bacillus. But it was not until 1896 that the Indian Plague Commission discovered the rôle of the rat and his flea, and the progress and extension of the disease through the migration of rats from infected districts.

Zirolia and others have found that the Bacillus Pestis multiplies in the stomach of the flea, retaining its virulence for over 20 days, so that the flea serves not only as the carrier but also as the mutiplier of the germs. When the infected rat dies, the fleas leave the cooling body and seek the nearest available host, communicating the plague bacillus either on its fouled mandibles or by regurgitation of the contents of its stomach during the act of sucking, or by provoking scratching and consequent inoculation by the bacilli deposited by its fæces on the skin. Rat fleas probably remain alive for two weeks after the death of the rat which infected them, and are dangerous during the entire period. The disappearance of plague in cold weather is due to the effect of the temperature upon the flea, as the B. Pestis can withstand freezing, while sunlight and drying are inimical.

Vergbitski claims that the bed-bug may play a part in spreading infection from man to man, as he experimentally transmitted plague from man to rats by infected bed-bugs, and plague bacilli have been found in such vermin taken from the beds of infected people. Some authorities also believe the same is true of the human flea—the pulex irritans.

In all epidemics of whatever nature, vaccination and inoculation immediately occur to mind as prophylactic and therapeutic agents. Haffkine, who had gained celebrity by his anti cholera vaccinations in India in 1893, was the first to use anti-plague vaccination in Bombay in 1897. He employed old killed broth cultures and reduced the number attacked by the plague to the extent of 77% to 85% and also diminished the mortality of those attacked.

According to Simpson, Haffkin's prophylactic "causes in a few hours a rise in temperature to 102 or sometimes 105 degrees F., headache, nausea, and discomfort, which usually continues for about 48 hours. At the site of inoculation, which is generally in the arm or loin, a painful swelling appears which necessitates rest for a day or two and remains evident for at least a week. Immunity is established in a week's time, but partial immunity much earlier. At no time does it render the inoculated more susceptible to the disease. The protection lasts, it is believed, for about six months." The dose is from 2 cc. to 5 cc. for an adult and .5 cc. to 1 cc. for children. It is injected subcutaneously under strict antiseptic precautions.

After Haffkin, Yersin prepared a serum by the immunization of horses with dead, and later with living cultures. The dose is from 10cc. to 20 cc., also administered hypodermically. Simposn says, "It does not cause nearly the same degree of discomfort or local inflammatory action and produces a more immediate immunizing effect; but, in some persons, it may be followed in a week or fortnight's time by symptoms simulating rheumatism, accompanied by swellings of some of the joints, which is successfully treated by the administration of salicylate of soda. The protective effect is limited to about a fortnight's duration. Owing, however, to the small discomfort which it generally produces, it can be repeated before the expiration of this period."

Simpson believes that neither Haffkine's prophylactic nor Yersin's serum "afford absolute protection against a plague attack, but they do protect in a very high degree, and if the person inoculated is afterwards attacked with plague, the chances of recovery are greater than when not inoculated." In the New Orleans epidemic of 1914 brilliant results were reported of the therapeutic use of Yersin's serum, when

used in large doses—200 cc. were given and repeated.

Strong and Kolle have recommended the use of living virulent cultures and Strong has practically shown that this method of vaccination can be carried out without danger. This vaccination consists of the intramuscular injection of one whole twenty-four-hour agar slant of the living virulent culture in an adult. The reaction is not excessive.

But we must recognize the fact that unless in the throes of an epidemic, it is manifestly impossible to enforce Haffkinization or other such prophylaxis in America. When we remember that there is today a large body of ignorant people who oppose smallpox vaccination, despite the fact that its worth has been proven over a century, it is readily understood how inoculation for plague would be regarded. Boston is especially unfortunate in this particular, having a large percentage of these blind fanatics, as well as Medical Freedom Leaguers and anti-vivisectionists who, however, never refuse, when ill, to receive the benefits of the investigations they so strongly condemn when well.

G. W. McCoy, director of the Hygienic Laboratory of the Public Health Service, regrets that in plague outbreaks, "popular and professional interest is so frequently centered upon prophylaxis by vaccines or serum, when the situation demands active measures against rodents." He says, "If people want to be vaccinated for prophylactic purposes, there is no objection in complying, but the community should not be allowed to delude itself in the belief that plague may be controlled in this manner. The essential features of an anti-plague campaign should be the extermination of rodents and not the immunization by means of vaccines and serums."

And it is on such authority, gentlemen, that I ask you to use your position as advisers of school children for the extermination of rats—the greatest prophylactic known against the most awful epidemic disease on earth.

THE EIGHTH HARVEY SOCIETY LECTURE.—The eighth Harvey Society Lecture was delivered at the New York Academy of Medicine on Saturday evening, March 12, by Dr. S. B. Wolbach, Associate Professor of Pathology and Bacteriology, Harvard University. His subject was "Typhus Fever and Rickettsia."

Original Articles.

SOME MODIFICATIONS OF TECHNIQUE IN GALL-BLADDER SURGERY.

BY G. FORREST MARTIN, M.D., F.A.C.S., LOWELL, MASS.

I PRESUME that my experience differs in no way from that of other operators, in that we develop, step by step, in each operation, a method of working, founded upon a set of convictions concerning the principles involved. The sum total of all this makes up what we may call our "technique." Some men are more original than others; some blindly follow every edict of certain leaders in the surgical field, even though they have to work pretty fast to keep up with the changes of methods which these leaders adopt; then there is a third class having the habit of studying the work of the leaders, both at first hand and in their writings, but at the same time have been grounded in the fundamental information which enables them to understand the underlying principles involved. These men think for themselves; are quick to see the weak or the strong points of some new measure, and in the end do creditable work in their own sphere. So the changes and improvements in technique come about.

Thus we have all seen the contests over hysterectomy between the advocates of the suprapubic *vs.* the vaginal route. We have seen many of our best operators turn "about face" on the question of perineal *vs.* suprapubic prostatectomy. We have followed in like manner the contest between the advocates of cholecystostomy *vs.* cholecystectomy, until today we have the indications for the proper selection between these two operations almost as clearly defined as is appendiceal surgery.

To illustrate the principle that the better the man the more willing is he to change his mind, let me quote a few passages from some of the best of them on this last question.

First let me quote W. J. Mayo under date of April 8, 1911. He wrote, "In early operations it is not necessary to remove the gall-bladder and this valuable organ can be saved." And in September of the same year he wrote, "Cholecystostomy with temporary drainage of the gall-bladder to the surface, is the operation preferred, because it saves this valuable organ for future function."

Two years later Moynihan wrote, "In many cases, in removal of the gall-bladder, we

are *doing away with the necessity for drainage*. by removing that structure the drainage of which seemed imperative. During the last eight years I have inclined more and more to the performance of cholecystectomy, and after some hesitation, and some trepidation, which experience removed, I am strongly disposed to advocate the frequent, though certainly not invariable adoption of this operation in preference to cholecystostomy. This in view of the character of the cases which submit themselves to surgical treatment."

At this same period, however, we find the same class of men teaching that cholecystectomy is not so safe an operation as cholecystostomy; that it requires larger incisions and more extensive manipulations; that the raw surface sometimes resulting in the gall-bladder notch of the liver after excision required special measures to stop the oozing of blood, etc., etc.

Now let us step ahead five years and hearken to Charles Mayo as follows: "Since our appreciation of the fact that infection is the prime factor we have revolutionized the surgical treatment of this condition at our clinic. Cholecystectomy in diseased gall-bladders or existing cholecystitis, with or without stones, gives a higher per cent. of cures than cholecystostomy. The figures are: 71% cured, 22 relieved and 7 not, for the former; against 53, 38 and 9 for the latter."

In 1918, in their clinic volume, we find this unhesitating statement: "There can be no question but that cholecystectomy as *as safe a procedure as* cholecystostomy, if the operator has had ordinary experience."

In 1918, we find Judd at the Mayo Clinic, writing as follows: "At the present time, with a larger experience, we are removing gall-bladders which we previously believed should be drained. Removal of the gall-bladder is indicated in all cases of cholecystitis. Gall-bladders containing stones would better come out. They probably do not function normally after drainage and its resulting adhesions, and there is much evidence that the stones re-form and the trouble recurs and operation becomes necessary."

And yet, in 1914, I saw Sir Abuthnot Lane, in his clinic in London, pick up a gall-bladder full of stones, examine it, and then drop it back into the abdominal cavity with the remark that he "would not bother about that." And he then proceeded to remove the entire large intestine for the digestive disorder.

Pathological changes in the gall-bladder walls or enlargement of the regional lymphatics are distinct indications for gall-bladder removal.

Quoting again from the Mayo Clinic: "Thick-walled, functionless gall-bladders are a *cancer menace* and should be removed. Gall stones are found in nearly all of our cases of carcinoma of the gall-bladder, although, as a rule, there had been no recent symptoms. However, a good early history of gall stones was usually obtainable, showing that the stones could have been removed at an earlier period and the carcinoma prevented."

It should also be clearly understood as a well established fact, that chronic cholecystitis without stones does exist as a definite pathological lesion, and produces a train of symptoms that will be relieved by removal of the gall-bladder. We may even find such gall-bladders little changed in appearance in a few cases and yet the regional lymphatics are enlarged and help the diagnosis.

So much for the principles underlying the call for gall-bladder operations.

Let us now discuss the methods of procedure. Let it be said in beginning that operations upon the upper abdomen have always been fraught with greater difficulties than in the lower. Chief among these have been the close apposition of many vital organs in a concentrated area, and the difficulty of keeping the intestines from crowding into the field where we must work. We find various incisions in use for entering the upper abdomen. Chief among these may be mentioned the Mayo-Robson, Kocher, Kerr and Bevan incisions. The two latter have no essential differences,—consisting of a vertical incision with oblique or curved extensions above and below.

Kocher parallels the lower border of the ribs diagonally. The Mayo-Robson incision starts like the Kocher and then drops directly downwards. In years past I have tried them all. rather preferring the Kerr. I have had more or less trouble to get a perfectly satisfactory closure, especially in very fat abdomens where the intra-abdominal pressure is always great. And this is the principal reason why *I am not using this technique now*. I want to impress upon you now, the anatomical fact that, in the triangle below the ribs and sternum the internal fascia, fused with the peritoneum, has fibres

which are *directly transverse.* These are cut directly across in all of the above described incisions, and in sewing up, not only do the stitches readily cut out under tension, but undoubtedly this also frequently happens in the first vomiting and retching which so often follow these operations.

It was not until two years ago that I had the courage to abandon this routine method and enter the upper abdomen, especially for gall-bladder work, by an incision directly transverse, and usually about two inches above the navel. At that time it was my good fortune to witness some gall-bladder surgery by Alex. Moschcowitz in New York, and I was much impressed by the beautiful exposure of the needed parts, and the facility with which the work could be accomplished through this transverse incision. It is to his work and to his writings on the subject that I owe much which I shall have to say in regard to this incision. I have used it frequently, both for work upon the gall-bladder and for such operations as gastroenterostomy, pylorectomy, and duodenal ulcers. It is equally good for all of them, and the more I use it, the better I like it! And this remark applies both to the time of operation and to the after results.

While operating, if a firm pillow is placed under the chest, across the back, the wound opens more readily and the intestines drop downwards towards the pelvis. Moynihan, in describing this procedure in his admirable work on abdominal operations, remarks, "The only disadvantage of this position is that, *when a vertical incision is employed,* the edges of the wound are necessarily very tense, owing to the pushing forward of the rib margin and the consequent tightening of the abdominal wall." How often have we found this true! Think of the strength that we have expended on retractors to overcome it! Then, in the very next paragraph he writes: "The best incision is a vertical one, made at first about four or five inches in length through the right rectus, near its outer border." Would not this seem to be a good argument against the vertical incision?

Now, I have demonstrated to my complete conviction, that the intestines require much less manipulation, and much less packing back, when the upper abdomen is thus entered, than is the case with the vertical incision. As the closed abdomen has no vacant space into which the organs can be pushed aside when room is needed, I have given considerable thought to the question of why there should be this difference in the intra-abdominal pressure when it is opened in these two different ways. And I have arrived at an explanation which I do not remember to have seen in print.

All surgeons are familiar with the greatly increased reflex disturbance which is caused by pulling or tugging upon a part as compared with the clean cutting of that same part with the scalpel or scissors, and those who work under local anaesthetics are frequently reminded of this fact. Now, nearly all deep work about the gall-bladder and ducts through a vertical incision, requires forcible distention, laterally, of the abdominal walls, either by manual or self-retaining retractors, for a considerable length of time. I am quite positive that this is a frequent cause of vomiting, and more important still, of resistance, on the part of the patient, thus requiring more anesthetic to keep him quiet. This incision opens so readily over the seat of our work, that this traction is much lessened. Within a week I have removed a large, firmly adherent gall-bladder which actually lay an inch to the right of the outer end of this transverse incision. Comment on this case seems unnecessary; yet we find many just such cases.

There is another quite large class of cases where, to my mind, it is equally valuable. I refer to those cases where we find the pylorus far to the right and adherent to the under surface of the liver or to the gall-bladder. I am quite convinced, from the study of many plates, that, where the x-ray findings show the pylorus well to the right in every plate, we have a good indication for operative interference, even though the findings may be entirely negative in regard to stones or ulcers. The normal stomach, as it empties, drops naturally to the left unless held to the right by adhesions. And these usually result from chronic cholecystitis! I have found these cases much easier to manage since I adopted this technique. If cholecystostomy should be the operation of choice, the drain can drop into any part of this incision and is far more direct than through the vertical openings. When it comes to the time of closing the abdomen the real value of the method becomes apparent. After the removal of the pad from beneath the back the incision literally drops into place and *invites the suture.*

I have said enough to convince you that I am already a very ardent cross-incisionist. Now what are the objections usually raised against it? The chief one is the cutting across of the rectus muscle. I think the answer to that is that the muscle is not the holding part of the abdominal wall. The fascia is far more important from the standpoint of strength and future hernia. Again, the nerves to this part of the rectus enter it almost horizontally, and from the sides.

All surgical principles are violated when a long vertical incision cuts off many of these control nerves of the rectus. In the transverse route, not more than one of these is cut, if any, and the muscle is carefully sutured back in place. The muscle repairs firmly and promptly, and I have yet to see one where any depression exists. It should also be remembered, as Deaver explains, that the lineae transversales, of which there are three between the navel and the sternum, limit the injury to a very small portion of the rectus. It has seemed very strange to me to see Judd, for instance, describing a very elaborate scheme of multiple transverse slits through the internal oblique fascia, after enlarging the longitudinal incision in the external oblique, to *avoid cutting across the fibres* of the aponeurosis of the internal oblique, when more room is needed either above or below the original incision. And yet in gall-bladder work in the upper abdomen, the strong combined internal oblique fascia and peritoneum is deliberately cut across in every operation. And in a paper written by the same operator in May, 1911, he says: "Many times we are tempted to remove an adherent appendix through a right rectus incision which was made primarily for a gall-bladder operation. But in so doing, we may be obliged to *sever one or more of the important nerves* which may cause the muscle to atrophy and allow a hernia to develop."

Why does this principle apply to the lower or middle part of the rectus and not to the upper?

I come now to the third and last feature of gall-bladder surgery which I wish to discuss. I refer to drainage. This is another part of the technique in which I have taken a radical "about face."

Many of you have doubtless read a recent communication from Dr. Bottomley reporting, I believe, twenty-three cases of chlecystectomy recently operated, in which he has closed the abdomen without drainage. Why not? I have, since reading that report, closed ten similar cases. Previous to this, my usual technique had been, for years, to attach a cigarette drain to the region of the cystic duct stump by a very fine plain c.g. suture to keep the deep end in place. This suture would soften and give away in four or five days, when the drain was usually removed. If the manipulations had been extensive, larger drainage was provided. In the meantime, there was usually more or less of a discharge of bile on the dressings which I have considered an excuse for the drain. Moschcowitz, whose work I have so much enjoyed, writes, on this question of drainage, as follows:

"It is conceded in general, that a most important factor in the production or prevention of post-operative hernia is the amount and the duration of the drainage. In this connection, I would therefore call attention to the fact that for a number of years it has been my custom to drain all cholecystectomies by a rather good-sized drainage tube, which is surrounded by strips of gauze so that the final drain has a diameter of nearly an inch. It is my custom to remove the gauze on the fourth or fifth day while the tube drain is shortened gradually, and is not removed until the tenth or twelfth day. In spite of this I have not seen a single hernia."

Now, I am willing to accept this as a strong argument for the transverse incision; but I am going to depart from his teachings in regard to the question of drainage. The more I have thought about the "drainage" question the more convinced have I become that the bile which the drain brings out comes entirely from the liver surface, and not from the cystic duct stump. If so, it is probably sterile in the great majority of cases, as it has never entered the ducts where it can be so readily contaminated by colon bacillus. I make this statement with full cognizance of the fact that Rosenow and others have been able to demonstrate that the blood stream is frequently the carrier of the infection to the walls of the gall-bladder and the ducts, for we are not going to close up our cholecystectomy cases in the presence of gross pus infection. And so I am trying out the closing up of all but these gross lesions without drainage, in the full belief that the peritoneum is able to care for a few germs from the bile stream which is itself an antiseptic. It does this with our appendix stumps, so why not with our cystic ducts? To make this study more valuable,

I have of late been taking a culture from the stump of the cystic duct before the cautery is applied to it. These cultures are showing colon bacilli and streptococci, so that we are able to say that the germs are there, and yet that the peritoneum is taking care of them very well. As further evidence of this fact I am able to add that the patients are making good recoveries with no more of the post-operative complications than was the average under the old method. I intend, from now on, to take cultures from the raw under surface of the liver also, to see if the small amount of bile that leaks from this surface is also sterile.

I do not need to remind you of the added comfort to the patient with the closed wounds as compared with the dressings of the drainage cases.

In conclusion, let me summarize the matter as follows:

Cholecystectomy is the operation of choice in all but a very limited field, such as elderly patients who must have prompt relief with a minimum shock; gross septic conditions which can be more safely handled by preliminary drainage, with complete operation later, and the like. The field of operation is better exposed, the bowels are kept out of the way more easily, the patient is quieter because less disturbed by manipulations with the transverse than is the case with any other operative method. Vomiting, straining, and other post-operative efforts tend to pull our incision tighter instead of apart, and thus our final wound is stronger. Closure of our wound without drainage bids fair to be an accepted procedure in a great majority of our cases. Experiments show that this is a safe procedure even in the face of positive germ cultures.

THE ENERGY REQUIREMENTS OF GIRLS FROM 12 TO 17 YEARS OF AGE.

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(Concluded from page 306.)

TOTAL CALORIES PER 24 HOURS PREDICTED FROM AGE AND WEIGHT.

We have already seen that the total 24-hour basal metabolism is, with all of these nine groups of girls, essentially the same, being represented by a round figure of 1250 calories, and we have stated that this value may properly be used for a general approximation. A careful inspection of the group data, particularly when plotted, shows that there is, however, a slight tendency for the total basal metabolism to increase with increasing weight, although, owing to the fact that there is a specifically high metabolism per kilogram of body weight with the younger and lighter weight girls, this tendency is not very pronounced. By plotting the data in Table X for the total calories per 24 hours referred to weight and drawing through the plotted points a line indicating the general trend of the metabolism, we are able to predict the most probable 24-hour basal heat production for girls weighing from 38 to 58 kilograms. These predicted values are given in Table XI herewith. From an inspection of this table, one is immediately struck by the fact that a group of girls with an average weight of 38 kilograms has a total 24-hour basal metabolism but 66 calories lower than a group weighing 58 kilograms. Thus, while the average value of 1250 calories is probably as close an estimate of basal needs as one is justified in making for girls of this age range, a slightly greater degree of refinement, on the basis of weight, is shown in the values given in Table XI. While there is only a very small difference in the total heat with a change in weight from 38 to 58 kilograms, Table XI is presented primarily as an extension of an earlier table giving the basal heat production of boys and girls per 24 hours predicted from body weight.[21] It is important here to note that when the total calories compared to age are charted and a line is drawn through the plots to indicate the most probable metabolic trend, this line is so nearly horizontal as to give an

Table XI.—Basal Heat Production per 24 Hours Predicted from Body Weight, for Girls Weighing from 38 to 58 Kilograms.

Weight (without clothing)	Predicted heat per 24 hrs.	Weight (without clothing)	Predicted heat per 24 hrs.
kgs.	cals.	kgs.	cals.
38	1218	49	1254
39	1220	50	1257
40	1225	51	1260
41	1228	52	1264
42	1230	53	1266
43	1234	54	1270
44	1238	55	1274
45	1240	56	1276
46	1244	57	1280
47	1248	58	1284
48	1250		

extreme range only of from 1256 calories with the 17-year-old group to 1245 calories with the 12 years, 2 months old group. Consequently, we are not justified in assuming any other than an average basal value of 1250 calories, when predicting the total 24-hour basal heat production from *age*.

PREDICTION OF THE BASAL HEAT PRODUCTION PER UNIT OF WEIGHT AND PER UNIT OF SURFACE AREA.

In the attempt to correct for the influence of the considerable differences in weight among individuals we may properly predict the basal metabolism on the basis of the heat computed per unit of body weight and, with certain reservations, per unit of surface area, referred both to age and to weight. A comparison of these four methods of predicting the basal heat production is of value from two points of view: first, the comparison enables us to determine which is the most accurate method *per se*, that is, the method involving the least error in prediction; second, it affords an opportunity for studying the relative accuracy of prediction from body weight and from body surface area, a question that is of great physiological interest. Consequently, we will treat all of these methods of prediction at the same time.

We have already noted in Table XI the important relationships between the heat per kilogram of body weight and both age and weight, and also the relationships between the heat per square meter of body surface area and age and weight. From the plotted points in Figures 2 to 5 and from the lines thereon representing the most probable in Table XII. For example, in predicting the metabolic trends we have derived the data given heat per kilogram of body weight from age, we refer to Figure 2 and find that at the age of 17 years the actual heat per kilogram is 21.7 calories, while the predicted heat, read at the point where the line representing the general trend passes the 17-year ordinate, is 21.2 calories. Thus the predicted heat is 0.5 calorie less than the actual, or the prediction is made with an error of —2.3 per cent.

An examination of the percentage errors involved when predicting the heat per kilogram

TABLE XII.—COMPARISON OF THE ACTUAL BASAL HEAT PRODUCTION OF GIRLS PER KILOGRAM AND PER SQUARE METER PER 24 HOURS WITH THAT PREDICTED (A) FROM AGE AND (B) FROM WEIGHT.

(a) Average age	(b) Average weight (without clothing)	Heat per kilo. per 24 hours						
		(c) Actual	(d) Predicted from age	(e) Predicted less actual (d-c)	(f) Percentage deviation ($\frac{e \times 100}{c}$)	(g) Predicted from weight	(h) Predicted less actual (g-c)	(i) Percentage deviation ($\frac{h \times 100}{c}$)
yrs. mos.	kgs.	cals.	cals.	cals.		cals.	cals.	
17 0	58.1	21.7	21.2	- 0.5	- 2.3	21.8	+ 0.1	+ 0.5
15 10	53.6	21.8	23.1	+ 1.3	+ 6.0	23.9	+ 2.1	+ 9.6
14 10	49.9	25.1	25.1	± 0.0	± 0.0	25.6	+ 0.5	+ 2.0
14 1	44.2	28.6	26.5	- 2.1	- 7.3	28.2	- 0.4	- 1.4
14 0	51.7	25.7	26.7	+ 1.0	+ 3.9	24.8	- 0.9	- 3.5
13 8	50.0	27.6	27.5	- 0.1	- 0.4	25.5	- 2.1	- 7.6
13 4	43.7	27.2	28.1	+ 0.9	+ 3.3	28.4	+ 1.2	+ 4.4
12 10	41.0	29.9	29.2	- 0.7	- 2.3	29.7	- 0.2	- 0.7
12 2	39.5	29.9	30.5	+ 0.6	+ 2.0	30.3	+ 0.4	+ 1.3
Average	----	----	----	----	± 3.1	----	----	± 3.4

Heat per sq. m. per 24 hours						
(j) Actual	(k) Predicted from age	(l) Predicted less actual (k-j)	(m) Percentage deviation ($\frac{l \times 100}{j}$)	(n) Predicted from weight	(o) Predicted less actual (n-j)	(p) Percentage deviation ($\frac{o \times 100}{j}$)
cals.	cals.	cals.		cals.	cals.	
777	745	- 32	- 4.1	760	- 17	- 2.2
745	793	+ 48	+ 6.4	808	+ 63	+ 8.5
830	835	+ 5	+ 0.6	858	+ 28	+ 3.4
911	866	- 45	- 4.9	914	+ 3	+ 0.3
876	869	- 7	- 0.8	833	- 43	- 4.9
928	884	- 44	- 4.7	857	- 71	- 7.7
867	898	+ 31	+ 3.6	916	+ 49	+ 5.7
922	920	- 2	- 0.2	923	+ 1	+ 0.1
915	946	+ 31	+ 3.4	924	+ 9	+ 1.0
----	----	----	± 3.2	----	----	± 3.8

referred to age (see column f, Table XII) shows that there are two instances where the error is 6 per cent. or more, but on the average the error is ±3.1 per cent. Thus it is possible to predict from the curve in Figure 2 the heat production per kilogram of body weight of groups of girls from 12 to 17 years to within a plus or minus error of 3.1 per cent. At this point attention should be called to the earlier predictions from general trend lines made by this Laboratory. Thus, in the prediction of the metabolism of young boys from 1 to 13 years of age it was found that on the basis of weight the total basal heat production could be predicted for boys above 10 kgs. to within an error of ±6.3 per cent., and for girls above 10 kgs. to within a somewhat greater error of ±7.5 per cent.[22] Computations of the predicted heat for boys and girls on the basis of the calories per kilogram of body weight referred to weight, showed no smaller average error, and consequently were not reported in detail. With the Girl Scouts, computations have shown that the prediction of the total heat from either weight or age is not as accurate as when the prediction is made per unit of weight and per unit of surface area. Under these conditions, as seen in Table XII, the error of prediction is not far from ±3.1 to ±3.8 per cent. At first sight, therefore, it would appear as if the prediction for girls between 12 and 17 years of age was of a very much higher order of accuracy than that for boys or for girls of younger ages. It is necessary, however, to bear in mind continually that we are dealing here with the prediction of the values for *groups* of girls, in which individual variations have in large part been wiped out, and consequently a direct comparison is not to be uncritically applied between the error of ±3.1 per cent. in the prediction of the heat production per kilogram per 24 hours from age for groups of girls 12 to 17 years old, and the error of ±6.3 per cent. and ±7.5 per cent. in the prediction for individual boys and girls, respectively, 1 to 13 years of age.

Of the four methods of prediction shown in Table XII, that is, the calories per kilogram of body weight predicted from age and from weight, and the calories per square meter of body surface predicted from age as well as weight, two are perceptibly better than the other two. That is, both predictions from age are made with a greater degree of accuracy than the predictions from weight, the error of prediction being ±3.1 per cent. in the case of the heat per unit of weight and ±3.2 in the case of the heat per square meter of body surface, as against ±3.4 and ±3.8 per cent., respectively, when the predictions are made from weight. But what is of most significance physiologically is the fact that when we compare the prediction per unit of weight with that per unit of surface on the age and the weight basis, respectively, we find that the prediction is somewhat better for the heat per kilogram of body weight than for the heat per square meter of body surface. As a matter of fact, the difference in the error of prediction between the heat per kilogram predicted from age and the heat per square meter predicted from age is almost insignificant, although the error is actually smaller in the former case. When the prediction is made from weight, the heat per kilogram may be predicted with measurably greater accuracy than the heat per square meter. It thus appears that with these groups of girls, at least, the heat production is somewhat more closely related to the weight than to the surface area, a finding quite in agreement with that noted with younger children of both sexes.[23]

Finally, it can be seen that for practical purposes there is a slight advantage in predicting the heat production of girls on the basis of the heat per kilogram of body weight when referred to age. Consequently we present in Table XIII values for the most probable basal heat production per kilogram of body weight per 24 hours for girls from 12 to 17 years of age, the values representing each half year.

TABLE XIII.—BASAL HEAT PRODUCTION PER KILOGRAM PER 24 HOURS PREDICTED FROM AGE, FOR GIRLS FROM 12 TO 17 YEARS OF AGE.

Age	Predicted heat per kilo. per 24 hours
yrs.	cals.
12	30.9
12½	29.9
13	28.8
13½	27.7
14	26.7
14½	25.7
15	24.6
15½	23.6
16	22.6
16½	21.7
17	21.2

Heretofore the best, if not, indeed, the only,

present-day standard used by clinicians for girls of this age-range is that offered by Aub and Du Bois,[24] who give the calories per square meter of body surface per hour for girls from 14 to 16 years of age as 43.0. This is the lowest age range for which they propose a standard, and it is of interest to compare this suggested standard with our actually determined facts. We studied two groups of girls averaging 14 years of age, who showed a heat production of 37.3 calories per square meter of body surface per hour. We likewise studied one group averaging 15 years, and one 16 years, having a heat production of 34.6 and 31.0 calories per square meter per hour, respectively. It can be seen, therefore, that the Aub and Du Bois standard is, on the basis of our determined values, 15.3 per cent. above the actually measured metabolism of the 14-year-old groups, 24.3 per cent. above that of the 15-year-old group, and 38.7 per cent. above that of the 16-year-old group. If we throw the data for all of our groups between 14 and 16 years together and get an average value, *i.e.*, 34.3 calories, the Aub and Du Bois standard is 25.4 per cent. above this. It is clear that however helpful the standards for males as presented by Aub and Du Bois may be, their standard for girls from 14 to 16 years of age should be very considerably revised.*

* While our subjects were asleep, the difference in standards can in no sense be wholly explained by this fact.

GENERAL TREND OF METABOLISM OF GIRLS FROM BIRTH TO SEVENTEEN YEARS OF AGE.

Throughout the study of the Girl Scouts and the younger children, reported elsewhere,[25] it is seen that changes in weight, age, and stature are all very closely correlated with basal metabolism. After the child reaches maturity, weight changes are very gross and the influence of age, though present, is slight. It is, therefore, impracticable to attempt any curve representation of the trend of metabolism from birth to old age, on the basis of weight or surface area. For the period from birth until 17 years of age such a comparison is, however, justifiable, and we give in Figure 6 the curve representing the calories per kilogram of body weight per 24 hours referred to weight for girls 17 years of age and under. From 2 to 26 kilograms the curve is identical with that recently published by Benedict and Talbot, based upon the study of a large number of normal girls.[26] From 38 to 58 kilograms the curve is identical with that in Figure 3 of this report and represents the measurements made upon the Girl Scouts. Between 26 and 38 kilograms the curve has been more or less arbitrarily smoothed, although it should be stated that the two curves, that of Benedict and Talbot and the straight line obtained from the measurements of the Girl Scouts, unite almost perfectly. It is clear that there is a specifically high metabolism per kilo-

FIG. 6.—BASAL HEAT PRODUCTION PER KILOGRAM PER 24 HOURS REFERRED TO WEIGHT, OF GIRLS 17 YEARS OF AGE AND UNDER.

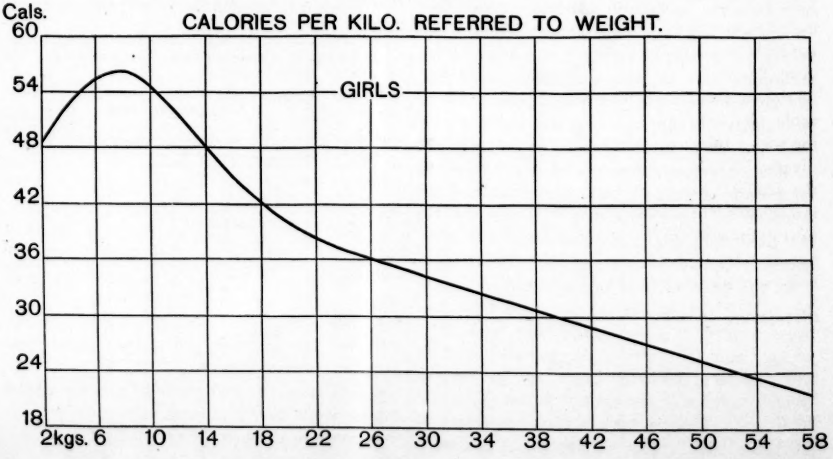
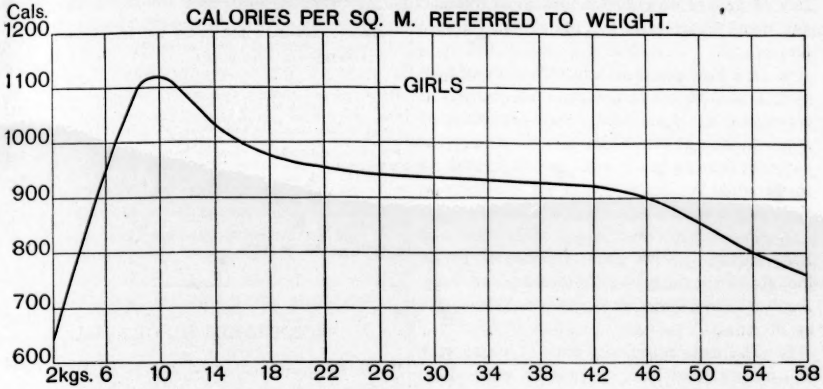


FIG. 7.—BASAL HEAT PRODUCTION PER SQUARE METER OF BODY SURFACE PER 24 HOURS REFERRED TO WEIGHT, OF GIRLS 17 YEARS OF AGE AND UNDER.



gram of body weight with girls of about seven kilograms, and that this gradually falls off as the weight increases, rapidly at first, but after 26 kilograms in essentially a straight line.

The trend of the calories per square meter of body surface area referred to weight is given both for the younger girls of Benedict and Talbot and for the Girl Scouts in the somewhat complex curve in Figure 7. Here up to 32 kilograms the curve is identical with that of Benedict and Talbot[27] and from 38 kilograms on is that derived from the Girl Scout material. It can readily be seen that a straight line smooths the curve between the weights of 32 and 38 kilograms perfectly. It is clear that there is a distinct tendency for the metabolism per square meter of body surface to remain at a very regular rate from 22 to about 44 kilograms. Thereafter there is a somewhat more rapid decline in the rate of heat production. It is impracticable to carry this curve into the adult stage, for with adults, weight, stature and age are very diverse. This curve flatly denies the legality of the general contention that the heat production is constant per square meter of body surface. Certainly with girls from birth to 17 years of age the heat production per square meter of body surface is a very variable factor.

INFLUENCE OF THE PREPUBESCENT STAGE UPON METABOLISM.

In Figure 6 the regularity of the curve for the heat production per kilogram of body weight for weights from 26 to 58 kilograms gives no suggestion as to the possibility of a particular influence of the prepubescent stage, which would correspond, roughly speaking, to weights of 40 to 50 kilograms. In Figure 7, however, where the calories per square meter of body surface are represented, there is a hint of a distinct decrease in the metabolism per square meter of body surface immediately following the prepubescent stage, this decrease pursuing a fairly regular course as far as the girls were studied. However, by reference to the earlier charts in figures 2 to 5 it can be seen that the distribution of the individual points indicating those girls who had or who had not reached puberty gives very little ground for assuming any special influence of puberty or the prepubertal age upon the metabolism of groups of girls.

SUMMARY.

1. The average, minimum, resting pulse rate per minute of girls from 12 to 17 years of age, just before rising in the morning, was found to be 81 at 12 years, 77 at 13 years, 77 at 14 years, 83 at 15 years, 71 at 16 years, and 74 at 17 years.

2. The insensible perspiration for these girls per kilogram of body weight per hour was as follows: 0.72 gram at 13 years, 0.71 gram at 14 years, and 0.77 gram at 15 years.

3. The respiratory quotients of groups of 12 girls each, about 7 to 8 hours after a light meal, were 0.81, 0.81, 0.78, and 0.79.

4. The caloric requirement of young girls during 10 hours of "bed rest" was on the average 55.0 calories per individual per hour.

5. The average 24-hour basal heat production of groups of girls from 12 to 17 years of age was 1250 calories per individual, irrespective of age.

6. The heat production per kilogram of body weight per 24 hours decreases regularly with increasing age from 29.9 calories at 12 years, 2 months, to 21.7 calories at 17 years. The curve indicating the general metabolic trend is throughout its entire length materially below the few scattered observations of earlier writers.

7. The heat production per square meter of body surface per 24 hours likewise decreases, but not so regularly, with increasing age, ranging from 928 calories at 14 years to 745 calories at 16 years.

8. The metabolism of groups of young girls can be predicted from the general curve indicating the heat production per kilogram of body weight referred to age to within an average error of ±3.1 per cent. The prediction for the heat production per unit of body weight is somewhat better than that per unit of surface area.

9. The curves representing the heat production per kilogram of body weight referred to weight and per square meter of body surface referred to weight for these groups of girls from 12 to 17 years of age blend with remarkable uniformity with similar curves based upon the measurement of a large number of normal girls from birth to 12 years of age.

10. No influence of puberty or the prepubescent stage is clearly proven in any of the results.

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BORNHARDT'S FORMULA.

BY H. GRAY, M.D., BOSTON, AND F. B. ALLEN, M.D., NORTH WALES, PA.

INTRODUCTION.

BOUCHARD said in 1897: "For a long time to come, good and serviceable medicine will be practised without geometric determinations; but there is a part of medicine in which they are indispensable. . . . . the diseases of nutrition." This field of pathology and the related study of normal weight have received a large amount of attention, as witnessed by the several standards of normal weight in the literature. Each has been used, more or less widely, according to the convenience of the form in which it was presented, the reputation of its author, or the positiveness with which it was claimed to be correct. But despite the great value of standards for determining normal weight to nearly every physician, the original claims have been tested but seldom by other than the original observers and reports of these tests showing the degree of accuracy of prediction obtained are rare. This accuracy is, however, easily quantitated, by figuring the deviation (error) of the calculated (predicted) weight from the actual (observed) weight, then converting this deviation in kilograms (or pounds) into an error expressed as a percentage of the actual weight, and finally averaging these per cent. errors for each method of prediction.

BORNHARDT'S FORMULA.

Accuracy in Relation to Formula. This has been demonstrated in previous papers by applying six of these standards (Bornhardt's, U. S. Army and Navy, Medico-Actuarial,

Guthrie's, Broca's, and von Noorden's) to two groups of healthy native American men totaling 249, and to Bornhardt's original series of 56. The percentage errors indicated that the most accurate was Bornhardt's rule, for its prediction error averaged 6.0% as contrasted with 8.3% for the next best and 23% for the worst.

Accuracy of Bornhardt's Formula in Relation to Age, Height, Chest-girth and Weight. From work reported by Mayall and myself, it is apparent that the prediction error:

1. Is not affected by age within the age-groups observed, *i.e.*, roughly 20-30; but some later studies (unreported) indicate unreliability in children weighing less than 55 kg. (110 lbs.).
2. It is not affected by height.
3. Is not affected by chest-girth.
4. Is affected by weight. When the subject is unusually heavy or light, *i.e.*, in this series less than 128 pounds, or more than 171, the error in prediction was notably larger. By inference from this, either these individuals were abnormal though not so recognized, or for such extremes a different formula is necessary.

Different Conceptions of the Normal. Bornhardt, in 1886, thought different standards advisable for judging persons of builds which to the eye seemed weaker or stronger than the average, and similar views have been discussed by others since, *e.g.*, Stratz 1914, Schlesinger 1917, Wood 1920.

In this connection it is pertinent to consider that while the usual "normal" is a mean, or better a mode, the mode is only a "dominant" (Lange 1903), between a high line above and a low normal below (Pfaundler 1916), thus bounding "standard lives" (Medico-Actuarial Committee 1912) in a "normal zone" (Holt 1918). From a theoretical standpoint the intensive mathematical studies by Pfaundler's pupils, Chose and Dikanski, 1914, and by himself in 1916, on the variation distribution, have commanded great interest in Germany, while from a practical point of view, at present, more value may be attached to the judgment of the Medico-Actuarial Insurance Committee, 1912, and Holt, 1918, that the limits of healthy normal variation should be taken as 10% from the mean, or of Emerson as 7%.

Review of Literature on Bornhardt's Formula. Bornhardt's first paper in 1886 dealt with the "body weight of drafted men as a means of determining fitness for military service." He quoted, as a straw man so to speak, the view of Quetelet, 1835, and Hammond, that the body weight of the healthy grown man bears a relation to his body length.

In passing it might be added that this view has been a vain inspiration to many others. A height-weight index (H/W), or a weight-height index (centimeter-weight, W/H), or an age-height-weight law, may be seen in the work of Broca (date ?), Von Noorden (date ?), Shepherd 1899, Bouchard 1900, Medico-Actuarial Committee 1912, Gaertner 1913, von Pirquet 1913, Matusiewicz 1914, Stratz 1914, Guthrie 1916, U. S. Army 1916, Pfaundler 1916, Whyte 1918, Dufestel 1920, Bardeen 1920.

Bornhardt, however, "was led by the fact that with increase of the chest girth, also the girth of the other parts of the body increases and that the product of the two measures given (height x chest) is the approximate expression of the body surface." On comparison of this approximate body surface with the body weight of eighteen artillery recruits, he noticed a definite relation between them. In people of *average* robustness and health they were as 1 : 5. "On substitution for Russian pounds and werschok, of grams and centimeters, the figures would naturally be different, but the results analogous." However, he further concluded that "with smaller height the weight may be greater, as in robust men; that the weight does not vary proportionately to the body surface, and that with the same surface the weight may be varied. Hence followed the conservative claim that "the body weight cannot be reckoned *a priori* from height and chest girth. These measurements, however, together with the actual weight, give us valuable data, whose relationship is a clear expression of the . . . . individual's fitness for military service."

In his second paper, with the same title as Paper I, a larger field of usefulness was claimed, and justly: "This gives us the possibility . . . . of calculating the body weight. If we call the height H, the chest girth C and the weight P, then the above relation is expressed for Russian units of measurement, by the equation:

$$HC = 5P \text{ or } P = HC/5 \quad (i.e.\ P = HC \times 0.20)$$

"The carrying out of the above calculations during recruiting is too time-consuming. It is desirable to reckon in advance a table for the weights of men of varying statures and chest

girths. This I have reckoned for men of *average* constitution all the way from 2 Arschin, 3 Werschok through 2 Arschin, 9 Werschok in height, and from 17 through 24 Werschok in girth at nipple level . . . . arranged *gradatim* according to rising height and chest measurements."

In Paper III on "The Numerical Definition of Bodily Constitution," he tabulated measurements and weights of 38 more recruits, and also discussed the tests of his method by Alexejewski and Abkowitsch: "The original Russian measures of weight and distance they transformed into centimeters and grams. . . . . Dr. Alexejewski, who made 79 measurings and weighings, and Dr. Abkowitsch, who weighed and measured 667 recruits, likewise came to the conclusion that a constant relation, varying only within very narrow limits, exists between height and chest girth on one side and weight on the other."

After these two Russians no further trials of Bornhardt's method seem to have been reported until thirty years later, when it was tested by the present writer on twenty American students and later on a larger group of 229 soldiers. True, the formula had been quoted, but without discussion, by Fröhlich 1895, Vierordt 1906, Baer 1912, Gaertner 1913, Barker 1916, and Vedder 1918. It was their translation of it which we have used throughout:

$$W \text{ (in kg.)} = H \text{ (in cm.)} \times C \text{ (in cm.)} \div 240$$

It was, however, more convenient, in order to record to the nearest integer without bothering with fractions (common or decimal), to transform kilograms into the smaller unit of pounds, thus yielding the hybrid formula:

$$W \text{ (in lbs. avoirdupois)} = H \text{ (in cm.)} \times C \text{ (in cm.)} \div 109$$

or, as multiplication is easier than division:
W (in lbs. avdp.) = H (in cm.) x C (in cm.) x 917
When testing Bornhardt's formula against his own reported observations conversion equivalents were used as shown in Table I.

TABLE I.

Linear Constants of Measure

1 arschin = 16 werschok = 71,120 cm. = 21,0000 inches
1 werschok = 4.445 cm. = 1.7500 inches
1.000 cm. = 0.3937 inches
2.540 cm. = 1.0000 inch

Weight Constants of Mass

1 Russian Funt (pound) = 0.4082 k. = 0.90 lbs. avdp.
1.0000 k. = 2.20 lbs. avdp.
0.4536 k. = 1.00 lb. avdp.

Possibilities of Improving Bornhardt's Standard. An improvement on Bornhardt's rule presumably might be made by utilizing more measurements of each subject, but any increase of the measurements beyond two would obviously make impracticable the expression of the results in a two-entry table, and so would oblige the worker to do his own calculating, a labor that would prevent the formula from coming into general use. Modification is possible, however, without encountering the difficulty just named, by taking no more measurements, but by altering the constant or by using a root or power of the height, or a similar function of the chest-girth, or a combination of these variations. This would make the formula no more difficult to use, but might reduce the prediction error (the main desideratum), and might incidentally produce an easier factor than 240, the constant in the usual metric translation of Bornhardt's Russian unit formula.

The cube of the height was experimented with by Buffon 1828, Livi 1886 and 1889, and Von Pirquet 1913, in vain according to Meeh 1879, Oeder 1915, and Von Pirquet 1917. The square of the height also has some theoretical reasons in its favor, and was experimented with by Quetelet 1871.

This is even more true of the square of the chest girth, because this power corresponds roughly to the area of a cross section of the chest at the nipple level where the perimeter is customarily measured. This statement is based upon the fact that the area of a circle = πR^2, or (since the circumference of a circle = $2\pi R$ and therefore $R = C/2\pi$), the area $= \pi (C/2\pi)^2 = \pi C^2/4\pi^2 = C^2/12.57$.

Then the body volume, if considered irregularly analogous to that of a cylinder, would be $H \times C^2 \times$ sp. gr. of the body $\div 12.57$. In practice the latter two numerical constants could be consolidated with any other necessary constant factor like that of Bornhardt's. One might expect accordingly that the height times the square of the chest girth ($H \times C^2$) would express the *volume* of the body as accurately as the height times the chest girth (HC) of Bornhardt expresses the *surface* of the body. One would certainly expect that some expression of volume would give a more precise for-

mula, because of the law of physics that weight varies as volume and not as surface, as pointed out in this connection by Moleschott 1879 and Meeh 1879. A further reason for squaring the chest circumference might be deduced (1) from the observation of Allaire in 1863, after studying 730 French recruits, that weight is modified less by stature than by the circumference of the thorax; and (2) the independent note of Dreyer in 1920 that the weights calculated from chest measurements show greater individual variations than those from trunk lengths.

The use of roots makes a formula excessively inconvenient for practical use. Squares are bad enough.

EXPERIMENTAL EFFORTS TO IMPROVE BORNHARDT'S RULE.

In the attempt to gain evidence along the lines of the above speculations we have tried a variety of formulae constructed by changing the constant and using squares.

This has been done for the most part empirically, trying various combinations that suggested themselves. In the case of the constant factor a guide has been obtained by substituting in the formula the actual weight of each case in a group, solving the formulae and averaging the factors to get the "constant." For example, using the formula: Weight (in pounds avoirdupois) equals H (in cm) x C (in cm.) x Factor, we got from the series of 229 soldiers the factor 909, and from this series combined with Bornhardt's 56, *i.e.*, a total of 305 cases, the factor 915. It also seemed interesting to see whether a different factor would be obtained by excluding those solutions of the formulae on the men who gave extremely high or low factors (owing to peculiarities of height or chest girth); on omitting therefore arbitrarily the 15 highest factors and the 15 lowest factors, a total of 30, or about 10% of the total, the remaining central and presumably more normal factors gave the average of 901 in the series of American soldiers mentioned, and 912 for the central factors derived from the consolidated group of 305 men.

The various experimental formulae were then applied to the recorded measurements and weights, and the percentage of error in predicting weight was calculated by the methods detailed in our previous papers. For the sake of simplicity only the average error without regard to sign, that is, the arithmetic mean, was considered; and no attempt was made to estimate the algebraic mean, the standard deviation, or the coefficient of variation. The resulting averages in Table II show that the least error, 5.6%, pertains to the formula:

W (in lbs.) = 91 x H (in cm.) x C (in cm.),
i.e. W (in kg.) = 414 x H (in cm.) x C (in cm.),
i.e. W (in lbs.) = 587 x H (in inches) x C (in inches)

Presumably the slight superiority over Bornhardt's of the factor here proposed is due to the larger series on which it was based.* In the same way the factor proposed can probably be excelled by anybody who will make similar calculations on a larger series.

The range of his series, of mine, and of Dreyer's† may be of interest and is given in Table III.

TABLE III.

	Bornhardt's 56	Gray's 249	Dreyer's No. ? in Book	Dreyer's 16 in Lancet
Age	21–25 yrs.	18–34 yrs.		13–52 yrs.
Height	165–182 cm.	147–193 cm.		140–186 cm.
Chest-girth	85–99 cm.	70–106 cm.	55–112 cm.	67.5–96.4 cm.
Weight	115–167 lbs.	105–236 lbs.	42–292 lbs.	66–196 lbs.
	52.2–75.7 k.	47.6–107.0 k.	18.9–132.9 k.	29.8–88.8 k.

* After determining on this factor 91, it seemed worth while to confirm the translation of Bornhardt's factor as hitherto cited in the literature and earlier in this paper, namely:
W (in kg.)=H (in cm.)×C (in cm.) divided by 240.
Starting from Bornhardt's model: W (in Russian Funt)=H (in Werschok)×C (in Werchok)/5, I got

$$W\ (\text{in kg.}) = \frac{0.4082}{5} \times \frac{H\ (\text{in cm.})}{4.445} \times \frac{C\ (\text{in cm.})}{4.445} = \frac{0.4082}{5 \times 19.758} \times H\ C =$$

$$\frac{0.4082}{9879} \times HC = \frac{1}{242} \text{ or } 4132 \times HC$$

instead of 1/240 or 417×H (in cm.)×C (in cm.) as hitherto translated.

$$\text{And W (in lbs. avdp.)} = \frac{0.9}{5} \times \frac{H\ (\text{in cm.})}{4.445} \times \frac{C\ (\text{in cm.})}{4.445} =$$

$$\frac{0.9}{5 \times 19.758} \times HC\ (\text{in cm.}) = \frac{0.9}{9879} \times H\ C\ (\text{in cm.}) = 911 \times H\ C$$

† To be discussed in a separate paper to be published shortly in this Journal. The bibliography with the forthcoming paper will include the authors here referred to.

SUMMARY.

For the estimation of the weight of a healthy person, the formulae of the U. S. Army and Navy, of the Medico-Actuarial Committee, of Guthrie, Broca, and of Von Noorden have been shown less accurate than Bornhardt's rule. The present study was begun with the hope of attaining even greater accuracy by some modification of Bornhardt's method. Experiments with various formulae are reported above, but the best of these was only slightly different from Bornhardt's, and was only slightly more precise, reducing the error from 5.64% to 5.61% when applied to the prediction of the weights of 305 men, collected in three different groups, aged 18 to 34 years.

We are greatly indebted for assistance in the large number of calculations here summarized, to Mrs. J. M. Walker of Lexington.

TABLE II.—RESULTS WITH EXPERIMENTAL FORMULAE.

SERIES	HC×90	HC×91	HC×917	HC×92	HC×93	HC×94	HC³	HC³×101	H²C×526	H²C×530
	FORMULA (H=height in cm.: C=chest girth in cm.)									
I 20 Students	5.80	5.70	5.55				6.25	5.50	5.00	
II 115 U. S. Soldiers (selected by lot)							6.64	6.99	6.48	
III 114 U. S. Soldiers (the remainder)							5.99	5.95	6.46	6.42
IV Total 229 U. S. Soldiers	5.79	6.00	6.00	6.20	6.60	7.1	6.31	6.47	6.48	
V Total 249 Normal Americans	5.79	5.98	5.96				6.31	6.39	6.36	
VI Bornhardt's 38	6.78	4.24	4.20				4.47			
VII Bornhardt's 18	5.56	3.42	4.20				3.22			
VIII Bornhardt's total 56	6.41	3.98	4.20				4.07	3.78	4.80	
XI Grand Total, 305 Normal Men	5.91	5.61	5.64				5.89	5.91	6.07	
	1	2	3	4	5	6	7	8	9	10

Book Reviews.

Clinical Ophthalmology for the General Practitioner. By A. MAITLAND RAMSAY, M.D., Glasgow: Oxford Medical Publications, 1920.

The author makes the following statement in his preface: "The book is not meant to take the place of a systematic treatise on Ophthalmology. It is purely clinical, deals with the symptomatology of Eye Diseases and is an attempt to present the subject as the general practitioner meets it in his daily practice."

This book can be recommended especially to the practitioner who, from choice or necessity, does his own eye work. It is rather more complete than the author's statement would indicate. Treatment is gone into minutely, and operative procedures, even the major ones, are described at some length. There are 500 pages of text, with 20 pages of plates, 11 of which are in color. Sixty pages are devoted to Therapeutic Formulae and Notes. Eye injuries and their treatment are given careful consideration. An admirable feature of the work is the arrangement of several of the chapters under the headings of signs and symptoms, thus: "The Clinical Significance of Oedema of the Eyelids," "The Clinical Significance of Failing Sight." With such an arrangement, the reader is at once shown the possibilities of his case and is not obliged to work backward by first making a provisional diagnosis and then reading to see if the case fits his diagnosis.

Lice and Their Menace to Man. By LIEUT. LL. LLOYD, *R.A.M.C.* (T.) With a Chapter on Trench Fever by MAJOR W. BYAM, R.A.M.C. London: Oxford University Press. 1919.

Within the last few years there has been collected a considerable amount of information concerning the lice of man. Since the war has made it necessary to discover more about its habits in order to combat its activities, scientists have worked unselfishly on this problem for the last four years. The rôle which the louse plays in spreading disease is an extensive one, and is responsible for a large proportion of human suffering. Typhus fever, relapsing fever, and recently trench fever, are attributed entirely to the activities of the louse. This volume, "Lice and Their Menace to Man," discusses the structure of the body louse, its early development, habits of living and feeding, and its dissemination. Methods of disinfection are varied; among them are hand-picking, brushing, ironing, dry storage, heat, and treatment by chemicals and greases. The habits of the head louse and of the crab louse and means of eliminating them are also considered in this book. The results obtained from experiments conducted on soldiers to determine the migration of body lice and their effects on man are illustrated by charts and tables.

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BOSTON MEDICAL AND SURGICAL JOURNAL

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SHARON SANATORIUM FOR PULMONARY DISEASES.

THIRTY years ago, the first state sanatorium for the care and treatment of patients with pulmonary diseases was established at Sharon, Massachusetts. Before that time, other private institutions had been organized for the treatment of tuberculosis: as early as 1857 the Channing Home had been established in Boston; in 1875 the first private sanatorium was established at Asheville, North Carolina; and in 1884 the Adirondack Cottage Sanitarium, now known as the Trudeau Sanatorium, was established at Saranac Lake, New York. In the beginning, the primary emphasis of the tuberculosis movement was laid upon cure; gradually, however, more thought was given to the prevention and early control of the disease. The step taken by Massachusetts in establishing the Sharon Sanatorium as a state institution is particularly significant, in view of the emphasis at the present time upon public responsibility for institutional care.

The Sharon Sanatorium affords opportunity for the treatment of incipient pulmonary disease arising in women and children who are unable, for pecuniary and other reasons, to go to distant health resorts. By the help of this institution, many young women, deprived temporarily of their power to earn money for their support, have been able, through rest, good food, fresh air and skillful medical supervision, to return to their occupations after a few months of residence and treatment at Sharon. In response to questionnaires which have been sent to all former patients, most gratifying answers have been received, some from patients who left the sanatorium twenty-eight and twenty-nine years ago. The public is deeply indebted to Dr. Vincent Bowditch of Boston for his untiring efforts to promote the work of this institution.

The results accomplished by the Sharon Sanatorium show how much can be done in the treatment of tuberculosis regardless of climate. Until recently, the means of meeting the tuberculosis problem in France have been entirely inadequate; but now that the experiment has been tried at Sharon, successful efforts have been made in climates formerly thought to be unfavorable to recovery. In this connection, a letter received from one who has been working with this problem in Brittany is of interest:

"When I went to Finistère, those (tuberculous patients) who could not go to an altitude or a warm climate, prepared to die at the hospital without any attempt to recover. Morlaix is called *'le puit de la tuberculose.'* With its narrow valley always full of fog, morning and evening, and lack of drainage, it is not an encouraging outlook for recovery. But the nurses had heard of Sharon, and a Mrs. Ewing, and others, and books, had told of your effort to cure, in any climate, and so, to prove it, I bought Porsmeur, situated on the hill but in the town of Morlaix. Needless to say, what had been proved at Sharon proved true in France as well. . . . In France they say, *'L'idée, c'est la force éternelle,'* and Sharon has it and holds it. We all owe an unbounded gratitude for the conception of such a place."

Among the advantages to be found at the Sharon Sanatorium is the Children's Pavilion

with its open-air school. It is to be regretted that the public, still, is not sufficiently educated as to the importance of placing in the most favorable environment children who show some tendency to tuberculosis. Physicians are aware of the necessity of recognizing that tuberculosis begins in childhood and frequently remains latent for many years before developing seriously in adult life. The new Pavilion is designed to provide the best hygienic conditions for cases of this sort. The remarkable improvement,—physical, mental, and moral,—which has been observed in children who have been placed under the care of the Sanatorium, proves beyond doubt the advisability of extending this work. In consideration of the difficulty in meeting the increased expenses at the Sanatorium, the Directors of the institution do not hesitate to make earnest appeal to the public for financial support, knowing that the work of the Sharon Sanatorium is of vital importance in controlling a most universal and insidious disease.

PUBLIC HEALTH AND THE SUBMERGED CLASSES.

THAT more than 75,000 men, women and children, out of a total population of 783,000, are dependents, delinquents, or feeble-minded and are unable either to work or fight and are a constant drain on the finances, health and morality of the State, has been shown by a survey conducted in Oregon. Moreover, more than 500 school children, out of a total school enrolled population of 32,500, were found to be more or less mentally deficient, a fact which is of much significance when it is remembered that the condition of the children of today is the best possible index to the condition of the community of tomorrow and to the future of the race.

The figures yielded by the Oregon survey are considerably lower than the average shown by the draft examination, a fact that indicates, in the opinion of the U. S. Public Health Service officers, that they are certainly not higher than those that would be obtained by similar surveys in other states. It is considered greatly to Oregon's credit that it has been one of the first states to realize the importance of the problem and to take effective steps toward ascertaining the exact facts concerning it.

The survey was authorized by the Oregon legislature and was carried out by the University of Oregon in collaboration with Dr. C. L. Carlisle of the U. S. Public Health Service. The following comments have been made by Surgeon-General H. S. Cumming:

"The making of the survey was not an easy task, for in Oregon, as in many other states, comparatively few of the types involved are being cared for in institutions. The rest are widely scattered and were practically unknown, for most of them are quiet and do not attract attention as do the insane and criminal. It was therefore necessary to build an organization to find them and report on them.

"As there was little money to pay trained workers, Dr. Carlisle enlisted volunteers, largely among the professional classes in every part of the state, and, through these, found the people, sought and collected data concerning their behavior, present history, school history, social relations (whether dependent, delinquent, or feeble-minded), and the cause of their condition.

"The prevention and correction of mental defectiveness, is one of the great public health problems of today. It enters into many phases of our work. Recent studies, made in connection with the spread of venereal diseases, have shown that feeble-mindedness is an important factor in prostitution. Work of the U. S. Public Health Service, in connection with juvenile courts, shows that a marked proportion of juvenile delinquency is traceable to some degree of mental deficiency in the offender.

"For years, Public Health Officials have concerned themselves only with the disorders of physical health; but now they are realizing the significance of mental health also. The work in Oregon constituted that first state-wide survey which even begins to disclose the enormous drain on a state caused by mental defects."

One of the objects of the work was to obtain for the people of Oregon an idea of the problem that confronted them and of the heavy annual loss, both economic and industrial, that it entailed. Another was to enable the legislature to devise a program that would stop much of the loss, restore health, bring to lives of industrial usefulness, many of those now unfit, and to save hundreds of children from growing up to lives of misery.

MEDICAL NOTES.

GRADUATE COURSE IN CLINICAL OPHTHALMOLOGY AT THE HOTEL DIEU, PARIS.—Professor F. De Lapersonne, assisted by Associate Professors Terrien and Guilleminot, Doctor Hartant, otorhinologist of the hospitals, and Doctors Velter, Prelat, Monbrun, chiefs of the clinic and laboratory, will begin on the tenth of May, 1921, a graduate course, with clinical examinations, and practical work in operative medicine and laboratory manipulations. The lessons and practical exercises will be held every day in May and June. A special certificate of the Faculty of Medicine of Paris will be given at the end of the course. Doctors and students, French and foreign, who desire to take the course, should give their names to the Secretary of the Faculty of Medicine. The number of students is limited to forty. The fee is fixed at one hundred and fifty francs.

AMERICAN CONGRESS ON INTERNAL MEDICINE.—At the annual meeting of the members of The American Congress on Internal Medicine, held at Baltimore, Md., week of February 21-26, the following officers were elected: President, Dr. Sydney R. Miller, Baltimore, Md., Clinical Professor of Medicine, Johns Hopkins University; Vice-President, Dr. Ellsworth S. Smith, St. Louis, Mo., Professor of Medicine, Washington University; 2nd Vice-President, Dr. James Rae Arneill, Denver, Colo., Professor of Clinical Medicine, University of Colorado; Secretary-General, Dr. Frank Smithies, Chicago, Ill., Associate Professor of Medicine, University of Illinois; Treasurer, Dr. Clement R. Jones, Pittsburgh, Pa., Professor of Medicine, University of Pittsburgh.

THE AMERICAN COLLEGE OF PHYSICIANS.—At the annual meeting of the Officers and Councilors of The American College of Physicians, held at Baltimore, Md., February 25, 1921, the following officers were elected: President, Dr. James M. Anders, Philadelphia, Pa., Professor of Medicine, Graduate School of Medicine, University of Pennsylvania; Vice-President, Dr. Frederick Tice, Chicago, Illinois, Professor of Medicine, University of Illinois; 2nd Vice-President, Dr. C. C. Bass, New Orleans, La., Professor of Research Medicine, Tulane University; Secretary-General, Dr. Frank Smithies, Chicago, Ill., Associate Professor, University of Illinois; Treasurer, Dr. Clement R. Jones, Pittsburgh, Pa., Professor of Medicine, University of Pittsburgh.

THE EYE SIGHT CONSERVATION COUNCIL OF AMERICA.—The Eye Sight Conservation Council of America is a membership organization. The directors and councillors are professional men representing various organizations devoted to health, welfare, education, science and industrial betterment.

The following are the officers: President, L. W. Wallace, New York, N. Y., who is President of the American Society of Industrial Engineers and recently elected an officer in the newly formed Federated American Engineering Societies of which Herbert Hoover is President.

Vice-President, Casius D. Westcott, M.D., Chicago, Ill., Chairman of Committee on Conservation of Vision of the Council of Health and Public Instruction of the American Medical Association.

The other directors are: R. C. Augustine, Decatur, Ill., President of the American Optometric Association; Bailey B. Burritt, New York City, General Director New York Association for Improving the Condition of the Poor; R. M. Little, New York City, Director of the Safety Institute of America—member of the Executive Committee of the National Safety Council.

The personnel of the Board of Councillors is to be carefully selected, and so far but a few have been chosen, these being: Dr. Thomas D. Wood, Teachers' College, Columbia University. Prominent in Educational Circles and Chairman of the Joint Committee on Health Problems in Education of the National Council of the National Educational Association and the A.M.A.

Dr. Frederick R. Green, Chicago, Ill., Secretary of the Council on Health and Public Instruction of the American Medical Association.

W. S. Rankin, M.D., Raleigh, N. C., State Health Officer of North Carolina, Member Executive Committee American Public Health Association.

Arthur L. Day, Ph.D. and Sc.D., Director in charge of Geophysical Laboratories, Carnegie Institute, Washington, D. C.

Allan J. McLoughlin, M.D., Assistant Surgeon-General, U. S. Public Health Service, Washington, D.C.

Guy A. Henry, Times Building, New York City, is the General Director.

The financing has been handled in a manner quite unusual. The optical industry and trade were approached directly on the principle that a movement of this nature should first of all be supported by an industry which will ultimately be benefited. The subscribing and underwriting of a sum was realized sufficient to assure success to the undertaking. While at this stage the financing is by optical interests, generally, support is not restricted to such interests and all activities of the organization will, at all times, be conducted free from the influence of commercial interests. The form of government safeguards against the possibility of any interest gaining ascendency and assures the conduction of all activities along broad humanitarian lines strictly in accordance with the following objects:

To promote the general conservation and betterment of vision, by arousing public interest to a proper appreciation of the importance of eye hygiene and the care of the eyes, especially in so far as it pertains to defective vision and protection in hazardous occupations: Disseminating knowledge regarding the optics of the eye, the prevalence of, and the need of correcting visual errors, and of suitable protection against the special hazards and eye strain encountered in various industrial occupations: Circulating information on the proper lighting of homes, schools, factories, offices and all private and public buildings: Striving to bring about the universal eye examinations of industrial workers and of school children, both rural and urban; also, urging the importance of periodic eye examinations for everyone: Developing or improving optical aids for the alleviation of visual troubles: Compiling reliable data, publishing and circulating literature pertaining to eye care: Enlisting the aid of, and rendering service to State and Federal Governments and all departments of health and education: Coöperating with all existing agencies concerned in any degree with the movement for better vision, and striving to coördinate their efforts: To act in all of these enterprises without bias or prejudice, actuated preëminently by a desire to further the public welfare and to increase the efficiency, comfort and happiness of humanity.

The work of this organization will be of particular interest to the ophthalmologists of the country and their assistance and coöperation is desired.

SYPHILIS AND INSANITY.—That syphilis causes a substantial percentage of existing insanity has long been recognized, but heretofore definite statistics bearing on the subject have been meager. To supply this need the U. S. Public Health Service queried the superintendents of 159 state hospitals for the insane, in regard to the number of inmates who had become insane by reason of the disease. Of the 115 replies received, 88 supplied data that could be tabulated; and from this, it appeared that 15.5 per cent. of admissions and 6.2 per cent. of inmates among the men and, correspondingly, 6.1 and 2.2 per cent. among the women, were directly due to the disease. The excess in the percentage of admissions over inmates is due to the comparative short life of those who became insane by reason of the disease.

VENEREAL DISEASE AND ACCIDENTS.—One of the largest telephone and telegraph companies in the United States has discovered that compensible accidents which happen to its employees bear a marked relation to the incidence of venereal disease. A large proportion of accidents to linemen, for instance, have been found to mark the beginnings of locomotor ataxia, a diagnosis which is almost always camouflage for syphilis.

AMERICAN MEDICAL ASSOCIATION CLINICS.—The following tentative list of clinics has been prepared for the meeting of the American Medical Association in Boston on June 6 and 7:

JUNE 6, 1921.

Demonstration at Eye and Ear Infirmary	10 A.M.
Gynecology, Carney Hospital	10 A.M.
Good Samaritan Hospital, Medical	10 A.M.
Good Samaritan Hospital, Orthopedic	10 A.M.
Carney Hospital, Medical	10 A.M.
Free Hospital for Women, Operations by Drs. Graves and Pemberton	10 A.M.
Children's Hospital, Clinic	9 A.M.
Infants' Hospital, Clinic	11 A.M.
New England Hospital for Women and Children	10 A.M.
Peter Bent Brigham Hospital	10 A.M.
Demonstrations, Infants' Hospital	9 A.M. to 6 P.M.
Boston City Hospital	10 A.M.
Massachusetts General Hospital	10 A.M.
Floating Hospital, Clinics	2, 3, 4 P.M.
Huntington Memorial Hospital	2 P.M.
Peter Bent Brigham Hospital	2.30 P.M.
Angell Memorial Animal Hospital, Open for Inspection.	

JUNE 7, 1921.

Eye and Ear Infirmary	9 A.M
Boston Lying-In Hospital, Clinics	9 A.M.
Carney Hospital, Medical	10 A.M.
Carney Hospital, Orthopedic	9 A.M.
Carney Hospital, General Surgical	9 A.M.
St. Elizabeth's Hospital	
Infantile Paralysis Clinics, Dr. Lovett's Clinics	10 and 11
Children's Hospital	10 A.M.
Infants' Hospital	10 A.M.
New England Hospital for Women and Children	9 A.M.
Peter Bent Brigham Hospital	9 A.M.
Demonstrations of methods on anesthesia, Boston City Hospital	
Boston City Hospital, General Surgical	9 A.M.
Massachusetts General Hospital	9 A.M.
Diabetic Clinic by Dr. Joslin	2 to 6 P.M.
Forsyth Dental Infirmary, Demonstrations of work interesting to doctors	2 P.M.
Peter Bent Brigham Hospital	2.30 P.M.
Demonstrations of Public Health Hospitals at Parker Hill Hospital	2 to 6 P.M.
Angell Memorial Animal Hospital open for inspection.	

THE AMERICAN JOURNAL OF TROPICAL MEDICINE.—The following announcement has been made by the American Society of Tropical Medicine in regard to *The American Journal of Tropical Medicine*, which is to be published for the benefit of physicians and research workers.

"The general experience of the medical sciences has fully demonstrated the advantages which accrue from the segregation of special subjects. A central organ for the prompt presentation of articles, that are now scattered over a wide field, or the lack entirely of a proper medium to turn to for publication, will be a great convenience to those interested in the study of tropical diseases, and also serve to stimulate the growth and development of the subject. The purpose of the new *Journal* will be to serve as a medium for the dissemination of reliable information from every source, with regard to the clinical and other phases of the nature, treatment, and prevention of tropical diseases."

The *Journal* will be published bi-monthly, by the Williams and Wilkins Company, Baltimore, Md. The transactions of the annual meetings of the American Society of Tropical Medicine, various reports, lists of members, and papers will be published in the *Journal*.

The following men are members of the editorial staff: Editor, H. J. Nichols, Medical Corps, U. S. Army, Army Medical School, Washington, D. C; Advisory Editorial Board, B. K. Ashford,, Medical Corps, U. S. Army, San Juan, Porto Rico; C. C. Bass, Tulane University, New Orleans, La.; M. F. Boyd, University of Texas, Galveston, Texas; C. F. Craig, Medical Corps, U. S. Army, Army Medical School, Washington, D. C.; George Dock, Washington University; Simon Flexner, Rockefeller Institute, New York City; William Krauss, Memphis, Tenn.; W. D. McCaw, Assistant Surgeon-General, U. S. Army, Army Medical School, Washington, D. C.; G. W. McCoy, Director, Hygienic Laboratory, U. S. P. H. S., Washington, D. C.; K. F. Meyer, University of California,, San Francisco, Cal.; E. H. Ransom, Department of Agriculture, Washington, D. C.; R. P. Strong, Harvard University; A. J. Smith, University of Pennsylvania; E. R. Stitt, Surgeon-General, U. S. Navy; W. S. Thayer, Johns Hopkins University; E. J. Wood, Wilmington, N. C. *Ex-officio* Advisory Editorial Board, The American Society of Tropical Medicine: J. M. Swan, President; K. F. Meyer, 1st Vice-President; V. G. Heiser, 2nd Vice-President; S. K. Simon, Secretary and Treasurer; George Dock, Councillor; C. L. Furbush, Councillor; J. F. Siler, Councillor; J. H. White, Councillor; C. S. Butler, Councillor.

GENERAL STAFF COLLEGE AT WASHINGTON.—A plan to have prominent physicians deliver addresses before the General Staff College at Washington, has been made by Surgeon-General Ireland. Two physicians who recently have addressed the College are, Dr. Joel E. Goldthwait of Boston and Dr. Thomas W. Salmon of New York.

BOSTON AND MASSACHUSETTS.

WEEK'S DEATH RATE IN BOSTON.—During the week ending March 19, 1921, the number of deaths reported was 233 against 251 last year, with a rate of 16.04 against 16.19 last year. There were 36 deaths under one year of age against 52 last year.

The number of cases of principal reportable diseases were: Diphtheria, 71; whooping cough, 36; scarlet fever, 70; measles, 101; tuberculosis, 49.

Included in the above, were the following cases of non-residents: Diphtheria, 9; scarlet fever, 4; tuberculosis, 4.

Total deaths from these diseases were: Diphtheria, 5; whooping cough, 1; scarlet fever, 3; typhoid fever, 1; measles, 2; tuberculosis, 23.

Included in the above, were the following non-residents: Diphtheria, 3; scarlet fever, 1; tuberculosis, 2.

Encephalitis lethargica: Cases, 3; deaths, 2.

HEALTH STATISTICS IN BOSTON.—For the week ending March 12, 229 deaths,—128 males and 101 females,—were reported by the Health Department of Boston. Of the deaths, 28 were due to pneumonia, 11 of lobar pneumonia and 17 of broncho-pneumonia; cancer, 18; nephritis, 15; tuberculosis, 10; diphtheria, 2; measles, 2; whooping cough, 2; influenza 1; syphilis, 2; diarrhea and enteritis, 3; erysipelas, 3; non-reportable diseases, 84; heart disease, 28; accidents and violence, 10; encephalitis lethargica, 1; septic sore throat, 1. Eighty-six of the deaths were among people over 60 years of age; 47 occurred among children five years of age. The number of deaths in public institutions was 119.

SOMERVILLE MEDICAL SOCIETY.—A meeting of the Somerville Medical Society was held on March 10, with seventy-five members present. The Legislative hearings on the Maternity bill were reported by Dr. Charles E. Mongan. There was a general discussion of the proposed changes in telephone charges, and a committee including Dr. Herbert E. Buffum, Dr. Edmund H. Robbins, and Dr. Eugene L. Maguire, was elected to investigate the matter of increased rates in behalf of the Society.

Dr. George C. Mahoney presented recommendations that stricter laws be enacted to enforce compulsory vaccination, and that the health authorities of the State circulate literature explaining the dangers of smallpox and the benefits of vaccination. The recommendations were accepted. Drs. Arthur N. Makechnie, Francis Shaw and Edward L. McCarty were appointed a committee to bring to the attention of the public, its rights in the employment of physicians in industrial accident cases provided for in the Workmen's Compensation Act.

Correspondence.

IDENTIFICATION OF BABIES.

Springfield, Mass., March 5, 1921.

Mr. Editor:—

The letter in your correspondence column in the current issue, on a new method of baby identification used in Boston, leads me to describe a samewhat similar method which has been in use at the Wesson Maternity Hospital, in this city, for eight years.

We maintain a supply of solid silver neck chains heavy enough for strength, but not to hurt the baby's skin. They are in such lengths as will not slip over the baby's head, 12 inches being right for the average baby. We also keep the small size oval metal rim commercial tags and a bottle of white shellac.

Before a baby is taken from the delivery room, its mother's name and her room or wardbed number is written in ink on the tag which is dipped in the shellac, drying instantly, waterproofing it. The tag is slipped on a chain, which is clasped around the baby's neck and never removed till discharge. Sterilizing makes the chains again ready for use. The racks on the cribs in the nurseries, of course, contain cards with all the usual data. The initial cost of the chains is not great and they last indefinitely, except that the spring clasps have to be renewed occasionally at a cost of 25 cents. Some mothers like to have the chain as a souvenir and we sell them at a small profit.

We hear not a word of fear that the babies may get mixed. The numeral system described by your correspondent seems to me open to easy mistakes of the figures 6 and 9. Our method has been well tried out as we have a thousand cases a year.

Very truly yours,
GEORGE C. MCCHAN, M.D.,
Secretary, Board of Managers.

SOCIETY NOTICES.

NEW ENGLAND PEDIATRIC SOCIETY.—The sixty-ninth meeting of the New England Pediatric Society will be held at the Boston Medical Library, Friday, April 8, 1921, at 8.15 P.M.

The following papers will be read:

"Otitis Media in Infancy and Childhood."
George Tobey, M.D., Boston.

"The History of Child Care as Reflected in Ancient Art." John Foote, M.D., Boston.

Light refreshments will be served after the meeting.

HENRY I. BOWDITCH, M.D., *President,*
LEWIS WEBB HILL, M.D., *Secretary.*

BOSTON CITY HOSPITAL.—Staff Clinical Meeting, Cheever Amphitheatre, Friday, April 8, 1921, at 8.15 P.M..

TOPICS.

1. "Diphtheria Bacillus Carriers: their Practical Significance." Dr. W. L. Moss.
   Discussed by Dr. Edwin H. Place.
2. "The A-B-C's of Blood Examination." Dr. T. E. Buckman.
   Discussed by Dr. Ralph C. Larrabee.
3. "The Practical Significance of Certain Laboratory Tests for Nephritis and Diabetes." Dr. R. W. Ohler.
   Discussed by Dr. David L. Edsall

Dr. Edwin A. Locke will preside.

Physicians and medical students invited. Open discussion.

DR. HALSEY B. LODER,
DR. H. ARCHIBALD NISSEN,
Committee.

RECENT DEATHS.

DR. MILES A. JEWETT, United States Consul at Trondhjem, Norway, died on February 25. Dr. Jewett was born in Turkey, the son of the Rev. Fayette Jewett, a medical missionary of the American Board in Turkey. Dr. Jewett received his medical degree from Harvard University in 1881. For a number of years he was physician at the State Insane Hospital at Danvers. From 1885 to 1893 he was a Fellow of the Massachusetts Medical Society. Dr. Jewett is survived by his widow, Mrs. Frances (Dudley) Jewett.

WILHELM VON WALDEYER.—Announcement has been made of the death of Wilhelm Von Waldeyer, professor of anatomy at the University of Berlin, at the age of eighty-five years.